# Introduction to Citizen Science and Watershed Groups

Rachel Durben, M.S.,Biology, Training Coordinator

Joanne Hild, M.S.,Biology, Executive Director

SIERRA Streams INSTITUTE

Linking water, science and people

# What is Citizen Science?

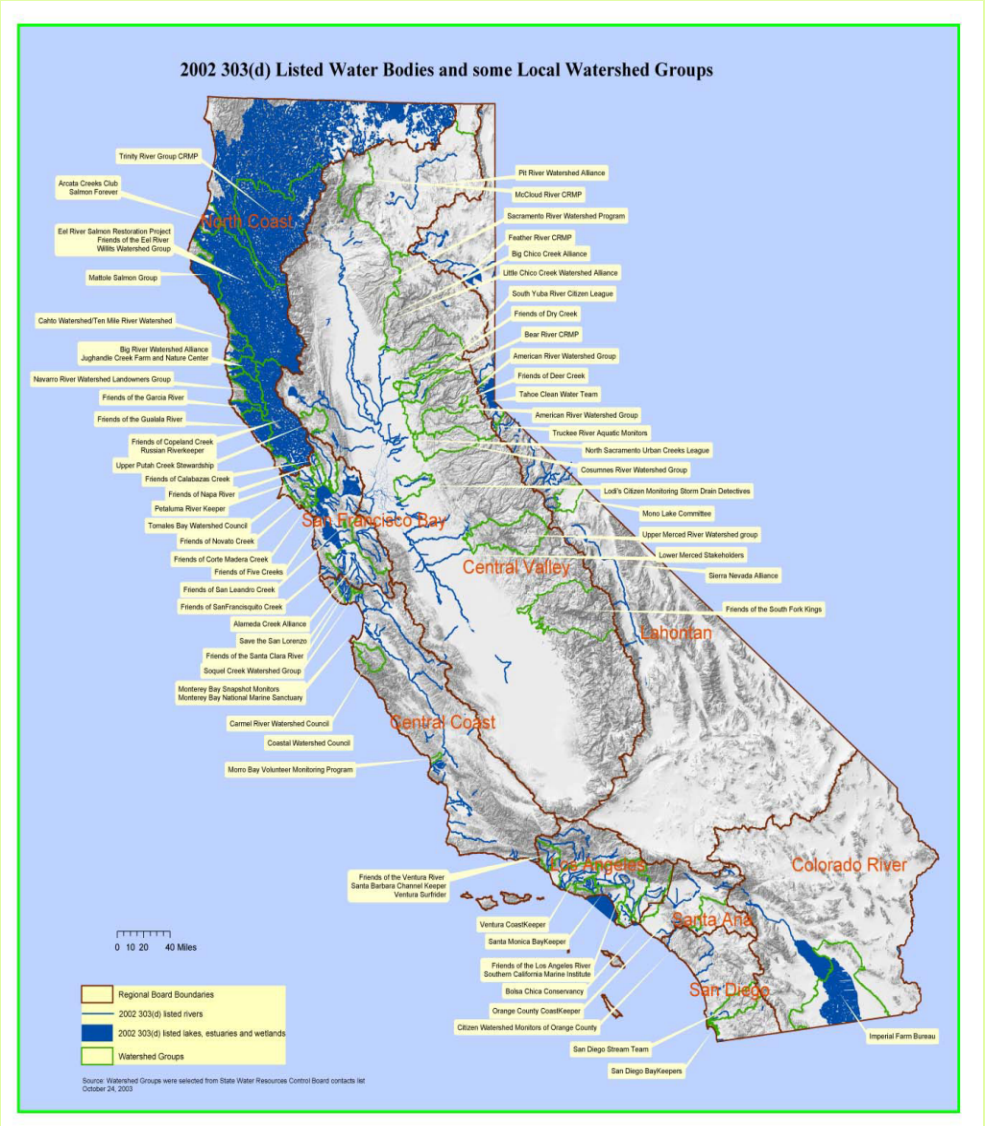
Also called Citizen Participatory Research

## It is a partnership in which public participants are involved in a scientific endeavor.

Partnerships can occur between:

- a university and a watershed group (e-Bird: Cornell and bird counts)
- a watershed group and its community (SYRCL and Nat. park closure)
- a scientific institute and its community (SSI and breast cancer study)
- a government agency and a watershed group (Safe to Swim).

# Citizen Monitoring - Who is involved?




There are over 200 watershed groups in California, so many opportunities for partnerships


Benefits of Partnering with Watershed Groups
Easy dissemination of data to public
Access to private property
Cost efficiency
Potential to gather extensive amounts of data
Local support and knowledge
Fast turn-around time
Stakeholder buy-in
Improve scientific research by getting different types of knowledge
Engages the community in the management of natural resources.

## Examples of watershed group projects

**Monitoring**- Stormwater, First Flush, BMP Assessment, Benthic Macroinvertebrate and Algae Bioassessments, TMDLs, Stormwater, 303(d) listings, Secchi Dip-In

**Advocacy**

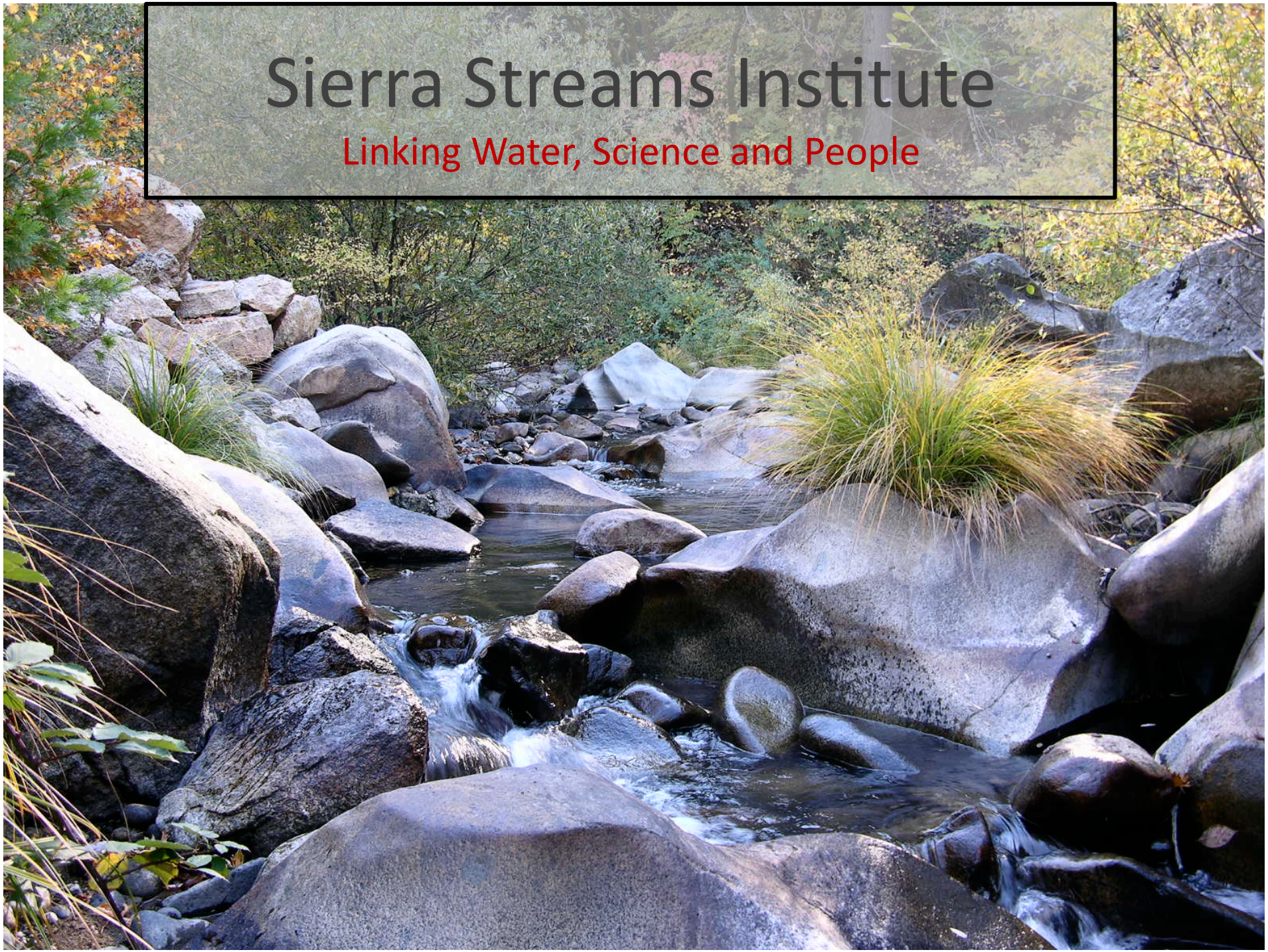

**Education** –public & charter schools STEM, Safe to Swim Fish contamination, trash

**Restoration -** native vegetation, salmon, Brownfields mining

**Community Health** - mining contaminants, *E. coli*, Safe to Eat

# Sierra Streams Institute

## Linking Water, Science and People



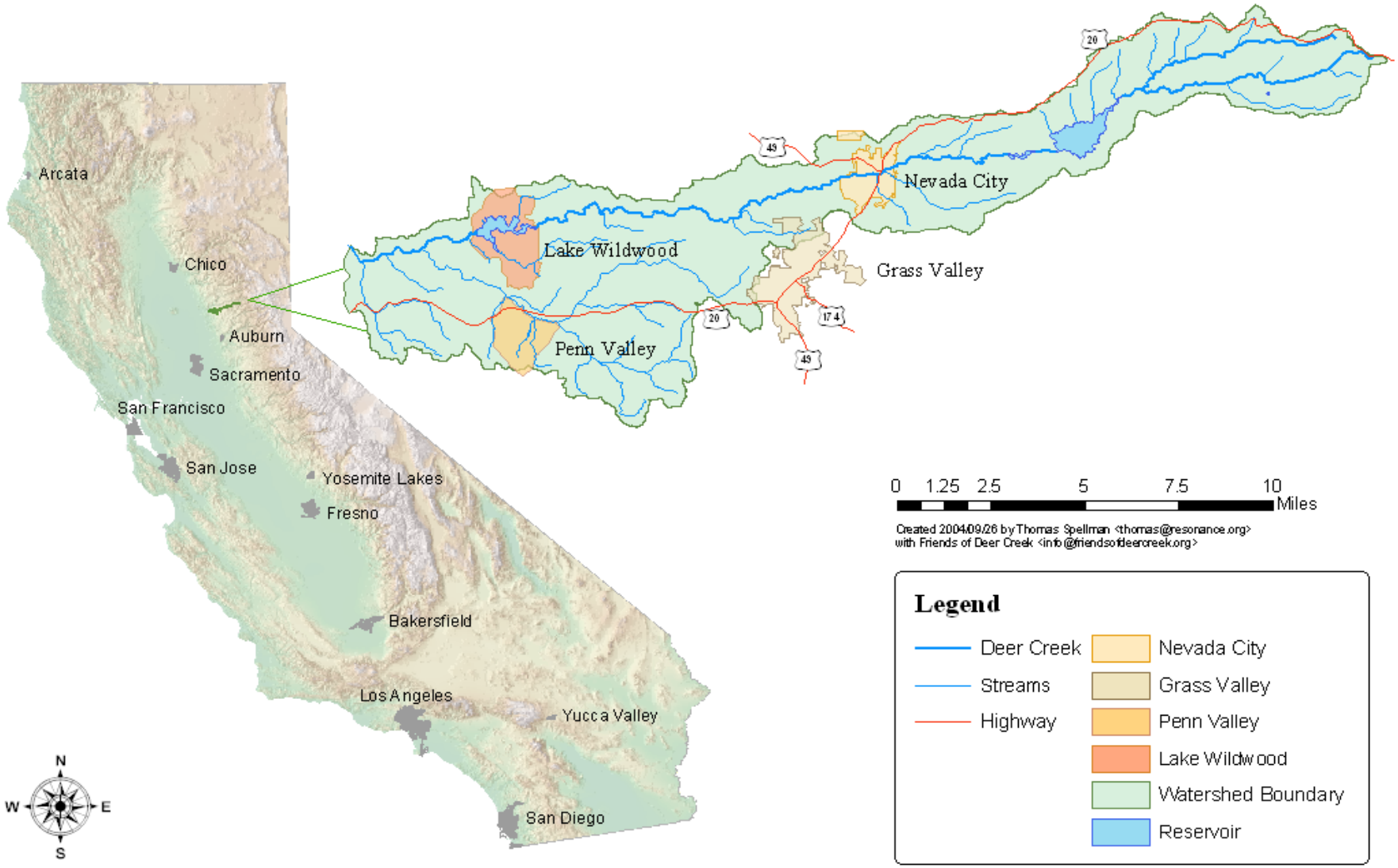
# Sierra Streams Institute History

- Started in 1996 as Friends of Deer Creek by a group of concerned local citizens and property owners, when Nevada City was replacing the historic Pine Street Bridge.

- Focus on scientific investigation and methods, to find solutions to Deer Creek's problems.


Sierra Streams Institute Programs
Restoration
Restoration of salmon habitat
Remediation of bacterial contamination
Research
Transport of mercury over dams
Health impacts of mining contaminants
Education
Activity-based science
Training
State protocols for watershed groups
Laboratory
Chemical and biological analysis

# Deer Creek Watershed



# Community-based Participatory Research

**Sierra Streams Institute is working with local citizens to improve:**

- environmental health of ecosystems
- human health of community members
- science/public health education

**Citizens participate in all levels of work.**

**Some Current Projects:**

- Restoration of native vegetation and endangered salmon habitat
- Health impacts/remediation of mining contaminants
- Health impacts/source id of bacterial contamination in swimming holes
- Study of correlation of Nisenan childhood stress with current health

# Providence Mine – Then…

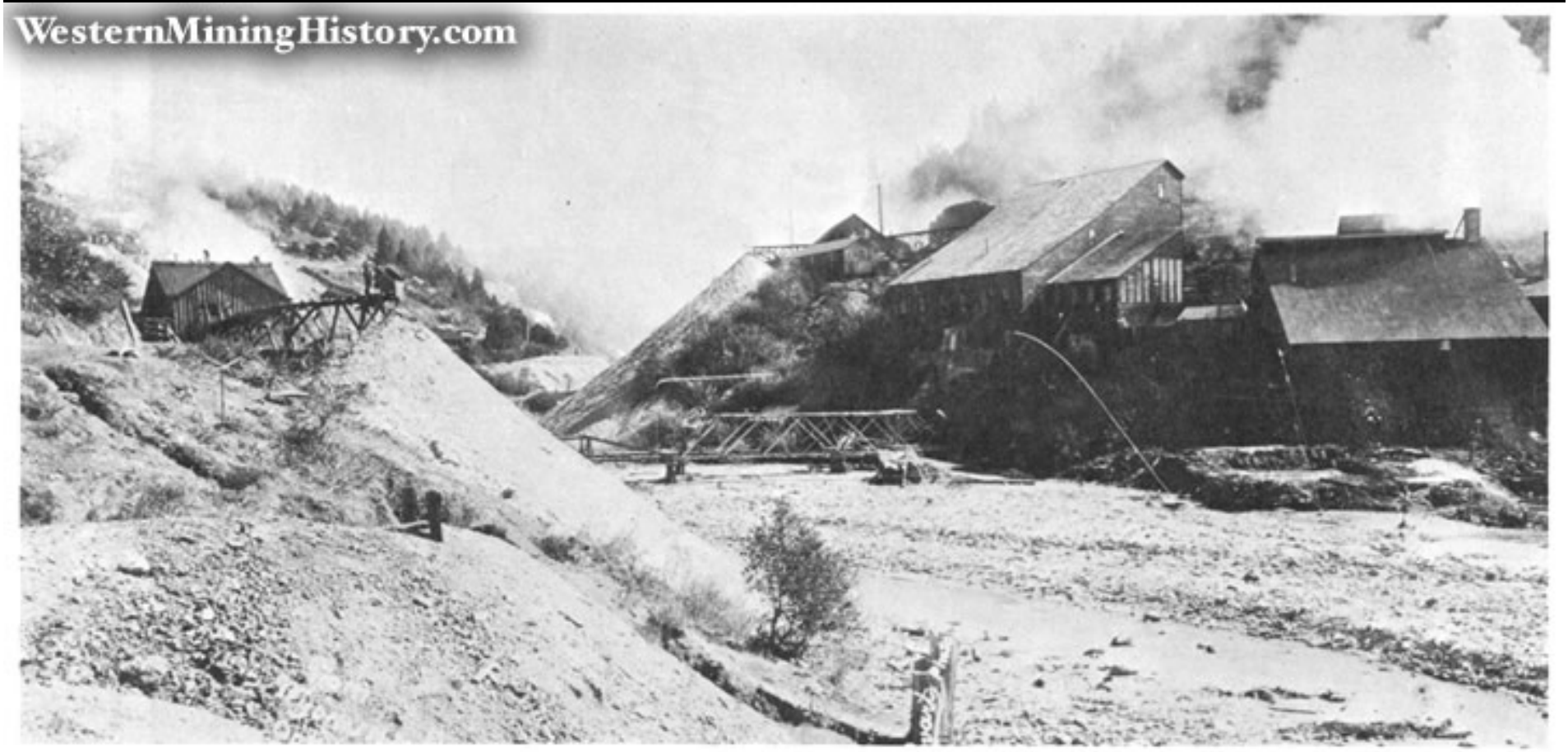



Photo 50. Providence Mine, Nevada City District. This 1893 view of the mine, in Nevada County, looks southeast. The Champion mine is at left, Deer Creek in the foreground.


And now…

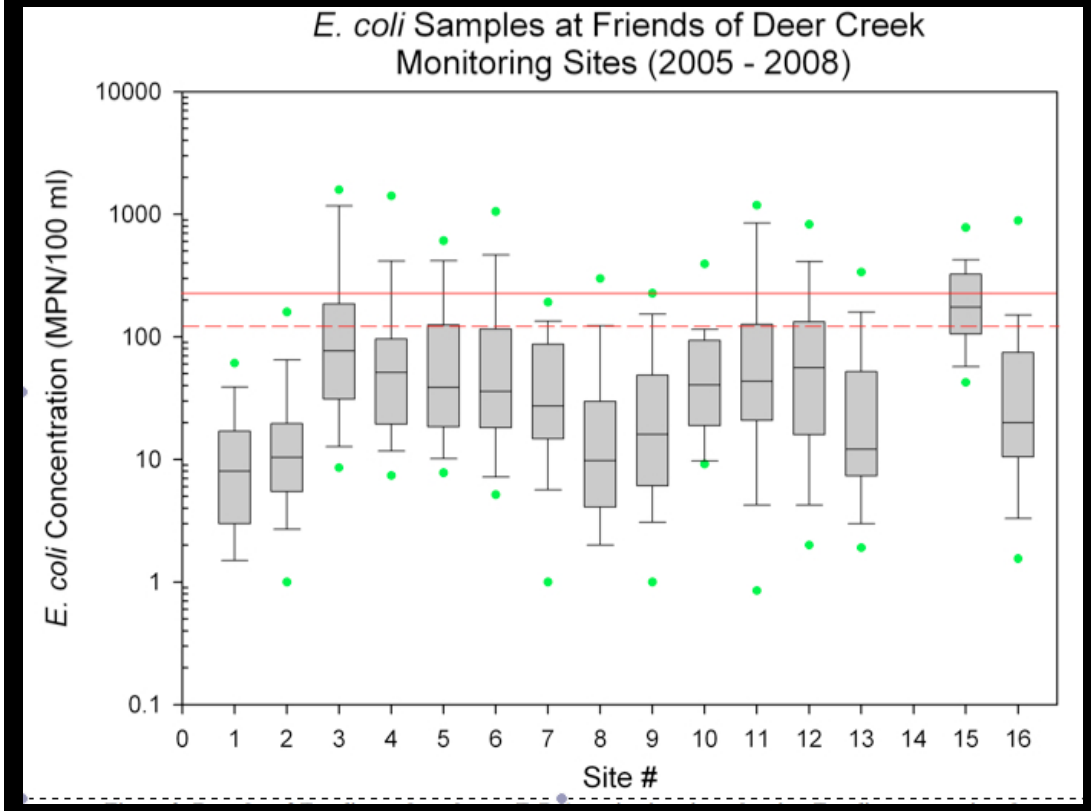
# EPA Brownfields Assessment/Cleanup

Cleanup includes traditional dig and haul and innovative methods such as:
Phytoremediation and addition of fish bone meal.

# Research

**What is the body burden of toxic metals among residents in a historically gold-mining region, and are these associated with residential proximity to abandoned mines and mine waste, use of well water, length of residence in this region, and daily behaviors and activities (home gardening, recreational activities, playground use, cultural practices)?**

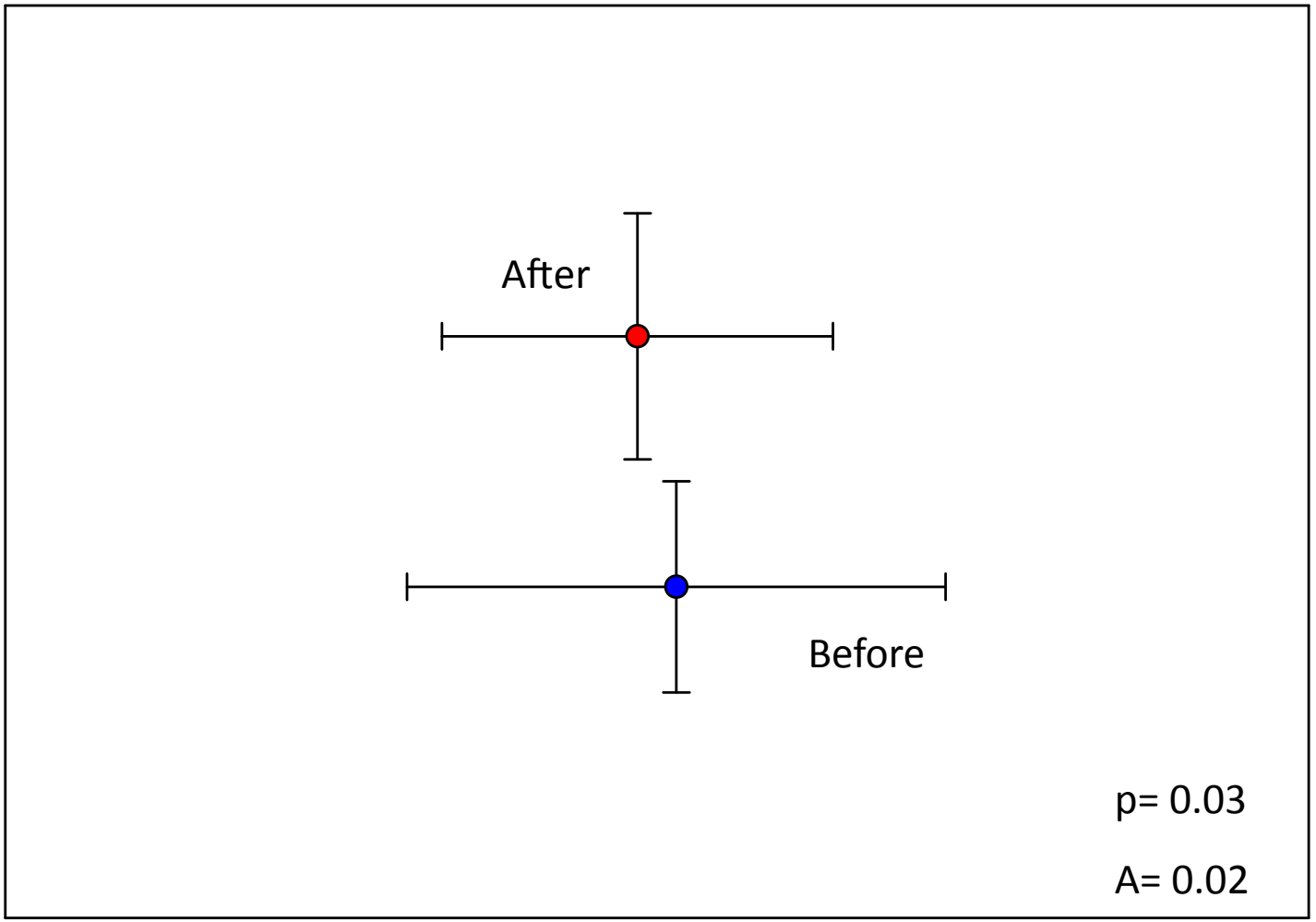
# Why monitor? *E. coli* contamination




# Pioneer Park Restoration


- Could not remove cement due to Arsenic contamination
- Removed invasive plant species, replanted with natives
- Added boulders and shifted bridge to change hydrology, reduce sedimentation
- Successful at getting City of Nevada City to follow BMP's

# Pioneer Park Restoration- BMI




**Axis 1**

# Indicator Species Analysis

(Dufrene and Legendre 1997)

## Group 1 (Before Restoration)

Trichoptera, Polycentropodidae:
Indicator Value= 32.1, p= 0.21
Filterer-Collector, Tolerance Value= 6

## Group 2 (After Restoration)

Megaloptera, Corydalidae:
Indicator Value= 37.5, p= 0.2
Predator, Tolerance Value= 0


Plecoptera, Pteronarcyidae:
Indicator Value= 40, p= 0.17
Shredder, Tolerance Value = 0

# Summary

- Restoration work is improving conditions for BMI communities

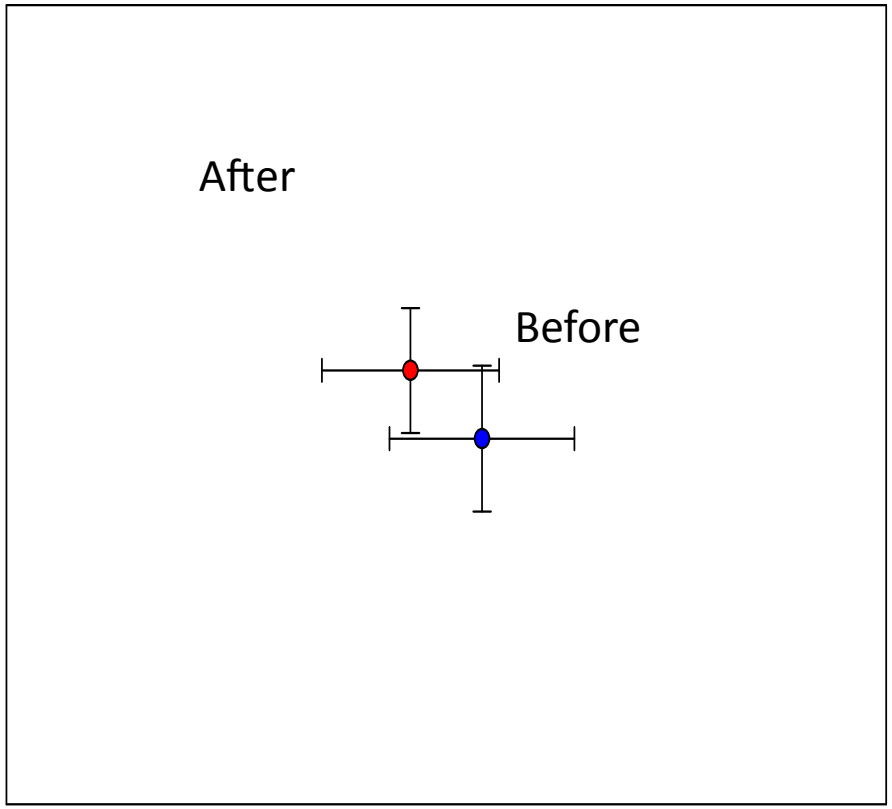
- BMI are good indicators of ecosystem health

- Results show volunteers & community how successful their work has been

# Lake Wildwood Wastewater Treatment Plant Upgrade

- Government mandate in June 2007
- Upgrade to fully denitrify wastewater, produce more consistent, contained flows
- Reduced $NO_3$ from μ= 1.085 mg/L to 0.67 mg/L (SE ± 0.18, z= -440.5, p= 0.03)
- Reduced water temperature from μ= 18.5°C to 15.9°C
  (SE ± 1.24, t= 2.16, p= 0.04)

# LWW Upgrade- BMI Communities




p= 0.057

A= 0.006

Indicator Species Analysis
(Dufrene and Legendre 1997)

**Group 1 (Before Upgrade)**

None!

**Group 2 (After Upgrade)**

Diptera, Tipulidae:
Indicator Value= 30.2, p= 0.05
Shredder
Tolerance Value= 3

# Deer Creek Salmon Restoration Project

Obstacles to Spawning:

- Lack of spawning gravels
- Management of reservoirs
- Water Temperature

Remediations:

- Gravel augmentation at 3 sites downstream of Wildwood
- Invasive species removal and native riparian re-vegetation
- Landowner outreach about Best Management Practices

# Education Program

- Scientist led
- Biological Field Sampling and Monitoring
- Laboratory Experiences
- Science Career Panels
- Student written Field Guides
- Native plant Restoration

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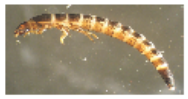
# Order by calling 530 265-6090

## Order Summary

Match your sample to the images and descriptions below.

**COLEOPTERA** Chapter 1



a.
- Segmented legs
- Leathery plates on entire body

**COLEOPTERA Adults** Chapter 1

b.
- Hard, oval shaped body
- Maxillary palps and antenna extending from head

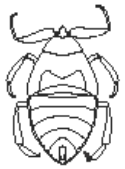
**DIPTERA** Chapter 2

c.
- Soft, fleshy body with prolegs

**EPHEMEROPTERA** Chapter 3

d.
- 1 set of wingpads
- Segmented legs with 1 claw on each
- 2 or 3 tails

**HEMIPTERA** Chapter 4



e.
- Head prominent with large eyes
- Wingpads
- Segmented legs

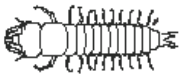
**HEMIPTERA Adults** Chapter 4

f.
- Ends of wings membranous

**LEPIDOPTERA** Chapter 5

g.
- Prominent head
- Short, stubby thoracic legs fused to body
- Prolegs on abdomen

**MEGALOPTERA** Chapter 6



h.
- Body slightly flattened with big mouthparts
- Segmented legs, various tails and appendages

**ODONATA** Chapter 7

i.
- 2 pairs of wingpads
- Large head with segmented antenna, large eyes
- Segmented legs with 2 claws
- Abdomen ends in short spikes or flat, thin gills

**PLECOPTERA** Chapter 8

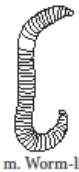
j.
- Long antennae
- 2 long, thin tails
- 2 pairs of wingpads
- Segmented legs with 2 claws

**TRICHOPTERA** Chapter 9

k.
- May be in a case
- Segmented legs
- 2 hooks on prolegs on end of abdomen

**NON-INSECTS** Chapter 10

l. With hard shell



m. Worm-like

n. With 4 or more pairs of jointed legs

*a. McCormick; b. CDFG ABL; c. McCormick; d. Cutter, L.; e-f. Elder; g. McCormick; h. Elder; i. McCormick; j. Elder; k-l. McCormick; m-n. Elder*



**Friends of Deer Creek**
Nevada City, California
www.friendsofdeercreek.org

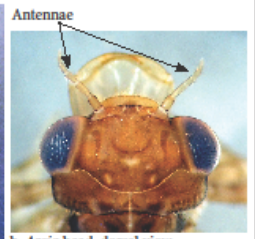
| | |
|---|---|
| Order: | Odonata |
| Suborder: | Zygoptera |
| Family: | COENAGRIONIDAE |
| # Genera/Species: | NA: 14 gen, 116 spp; CA: 8 gen |
| Common Name: | Narrow-winged or Pond Damselflies |

**Taxonomic Characteristics:**
- Body length 13–25 mm
- All segments of **antennae** about the same length (b)
- **Labium** (lower lip) stout and somewhat trapezoidal without medial notch (d)
- 3 inflated, leaf-like **gills** similar in length, ending in a point, and with small, highly branched veins joining main vein diagonally (a, c)

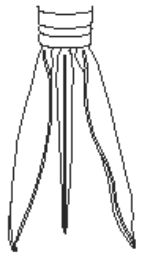
**Biological Information:**
Coenagrionidae are the largest family of damselflies in North America. Most prefer the slow, quiet water of ponds and stream edges where the larvae climb on vegetation or sprawl on soft bottom sediment, while a few species favor pool or riffle areas in streams or rivers.

**Tolerance Value: 9**
**Functional Feeding Group: p**

a. *Argia*, dorsal view




b. *Argia* head, dorsal view



c. Leaf-like gills

d. Stout labium, lacking median notch

e. *Argia lugens*, lateral view

*a-b. McCormick; c. Elder; d-e. McCormick*

**Taxa Tips!** Easily identified by ruling out other families. Calopterygidae have large basal antennal segments that are longer than all the others combined, and Lestidae have an extremely long, narrow labium.

**Notes:**

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